

Does the duration of breast feeding matter?

Maybe—but not enough to counter current support for breast feeding

Papers p 643

Any suggestion that breast feeding could confer long term disadvantage seems immediately counterintuitive. It is also controversial. A paper in this week's *BMJ* contains evidence to suggest, however, that extended breast feeding may lead to later adverse cardiovascular outcomes (p 643).¹

In developing countries exclusive breast feeding is associated with reduced mortality and improved growth. In developed countries it also confers advantages: in addition to reducing childhood infections, breast feeding may also protect against later diseases such as insulin dependent diabetes mellitus, inflammatory bowel disease, coeliac disease, and lymphoma.² More recently, breast milk consumption by preterm infants has been shown to be associated with lower blood pressure in early teens.³ The superiority of breast feeding is therefore unchallenged, but its optimal duration has not been adequately investigated, and breast feeding is currently recommended for "as long as is mutually desired."² Several challenging strands of evidence now point to the need to reappraise that view.

Over a decade ago epidemiological studies showed an association between disproportionate fetal growth resulting from fetal undernutrition and an increased incidence of an unfavourable constellation of adult cardiovascular disease, hypertension, glucose intolerance, and hyperlipidaemia.⁴ They also showed an increased risk of death from ischaemic heart disease in men who had been breast fed and not weaned at one year (standardised mortality ratio 97) compared with those who were weaned at one year (SMR 79) and those who had been breast and bottle fed (SMR 73).⁵ Similarly, late weaned men also had higher total cholesterol, low density lipoprotein cholesterol, and apolipoprotein B concentrations. Those infants not weaned at 1 year weighed less at 12 months and had fewer teeth than weaned infants, indicating a possible difference in nutritional status between the two groups. However, unweaned infants had a similar standardised mortality ratio at all weights at 1 year, including large infants, suggesting that nutritional status at 1 year was unlikely to be a causal factor. In fact, among the late weaned men, those with a high birth weight and lower weights at 1 year had the higher death rates from ischaemic heart disease and the more unfavourable lipid profiles.⁵

The second line of evidence came from studies in the baboon which showed that the method of infant feeding programmed cholesterol metabolism in the

adult. Exclusive breast feeding throughout infancy, followed by a diet high in saturated fats, was associated with an abnormal lipid profile and more arterial fatty streaks in mature animals.⁶

Leeson et al have now contributed a third line of evidence.¹ Using high resolution ultrasound, they found that in 331 young adults a history of breast feeding for four months or more was associated with significantly lower brachial artery distensibility (greater stiffness) than in those breast fed for less than four months or exclusively formula fed. They also confirmed a previous observation that reduced distensibility was associated with increased cholesterol and systemic blood pressure. Intriguingly, Leeson et al showed that a longer duration of breast feeding was not associated with high cholesterol or lipoprotein concentrations; nor was the strength of the association between breast feeding duration and distensibility affected by inclusion of lipid profile, body mass index, height, weight, or social class in the regression model. They did not mention the impact of birth weight or weight at 1 year, presumably because the data were not available, although this group has shown that increased carotid stiffness is present in children of low birth weight. The impact of prolonged breast feeding could be biologically as well as statistically significant: the authors point out that each two months extension of breast feeding is equivalent to a 1 mmol/l rise in cholesterol concentration or a 4 mm Hg increase in blood pressure.

These observations raise important questions about the validity of extrapolating changes in the dynamic properties of blood vessels in early life to altered cardiovascular outcomes in middle age. Completely convincing evidence would require longitudinal study of various vascular risk factors, beginning in early life, together with examination of whether abnormal characteristics track between childhood and early and late adult life. Meanwhile, how valid are the method Leeson et al used, and other related methods, to investigate cardiovascular programming?

Three non-invasive methods have so far been used, two of which are endothelium-dependent. Endothelial dysfunction (characterised by an inability to release nitric oxide) occurs early in atherosclerosis, before plaque formation. It also predisposes to thrombosis, leucocyte adhesion, and mural smooth muscle proliferation. In 1992 a non-invasive method of following changes in arterial diameter in response to increased flow using high resolution ultrasound was

described.⁷ Flow mediated dilatation has been shown to be impaired in the presence of classic risk factors for the development of atherosclerotic disease: cigarette smoking, established coronary artery disease, diabetes, and familial hypercholesterolaemia.⁷ Subsequently, endothelium-dependent flow mediated dilatation was shown to be positively associated with birth weight when studied in 9-11 year old children; the relation was not affected by adjusting for childhood body build, parity, cardiovascular risk factors, social class, or ethnicity.⁸

Further information on endothelial function has been obtained using laser Doppler to follow local changes in skin perfusion after application of acetylcholine, a potent inducer of endothelial-dependent vasodilatation. Impaired responses to acetylcholine were present in schoolchildren who were small for gestational age at birth and in small for gestational age neonates.^{9 10} Neonatal responses to heat induced vasodilatation (non-endothelial-dependent) were unimpaired.⁹

The third method, again using high resolution ultrasound, measures arterial distensibility, an index of vascular elastic behaviour.¹¹ It is affected early in arterial cholesterol accumulation in animal models, and in adults loss of distensibility has been reported to be an early marker of the accelerated vascular ageing seen in prediabetic and prehypertensive states in young adults. Arterial distensibility is also reduced in 9 year olds born small for gestational age, and in school age children there is an inverse relation between brachial artery distension and cholesterol, low density lipoprotein, and apolipoprotein concentrations.^{10 11}

Measures of arterial behaviour as early predictors of atherosclerosis or ischaemic heart disease therefore appear to have biological plausibility, and abnormalities are associated with classic predictors of atherosclerosis as well as the relatively novel risk factor of low birth weight for gestational age. In contrast to previous epidemiological and animal studies, the current study linking breast feeding and arterial distensibility does not suggest that later arterial disease is caused by abnormal blood lipids. As the authors point out, the observations are more consistent with the higher circulating cholesterol concentrations seen in breast

fed babies leading to increased cholesterol deposition in the vessel wall, which then does not spontaneously regress because of interference from a high saturated fat, Western diet.¹

Today's paper should not alter current recommendations about breast feeding being the best way to promote infant and maternal health. Independent corroboration in different populations is required before the potential impact of these observations can be assessed. In developing countries the massive benefits of prolonged breast feeding for infant survival and health, together with child spacing, will probably never be outweighed by considerations of ischaemic heart disease 50 years later.

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Providing clean water: lessons from Bangladesh

Large parts of the world face an unwelcome choice between arsenic and micro-organisms

The people of Bangladesh are being slowly poisoned. Although the world has known this since 1998, the full implications are only just being realised. Up to 57 million of Bangladesh's 130 million inhabitants are drinking water that contains harmful concentrations of arsenic.¹ The tragedy is two-fold: it was a well intentioned public health measure that caused the problem in the first place, and there are no easy solutions. Discussion at a meeting in January between the Department for International Development, the British Geological Survey, and non-governmental organisations emphasised the difficulties of reaching a workable long term solution.

The World Health Organization's provisional guideline is that drinking water should contain no more than 10 µg/l of arsenic,² though the Bangladesh standard is 50 µg/l. Water samples from many Bangladeshi tubewells have concentrations exceeding these values, with extreme concentrations greater than 500 µg/l.^{1 3}

Chronic arsenic ingestion has many health consequences, ranging from skin disorders to cancer, diabetes, and cardiovascular, respiratory, and peripheral vascular disorders. A clear dose response relation exists between arsenic concentration and skin and internal cancers, with a latency period of up to 20 years.⁴ Though chelation and vitamin supplementation

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